ENSF 338 Lab 3

Group 35

Exercise 4

In class we have discussed how quicksort's worst-case complexity is $O(n^2)$, but its average-case complexity is O(nlogn)

1. Derive the formula for worst-case complexity [0.4 pts]

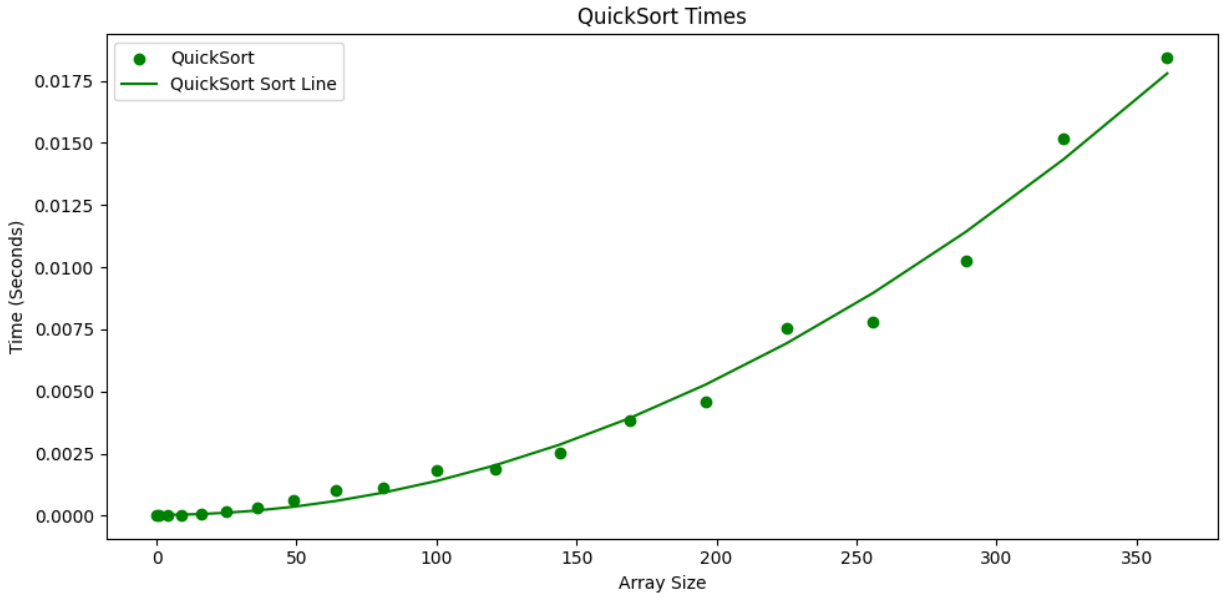
Answer:$O(n + (n-1) + (n-2) + \cdots + 2 + 1) \rightarrow O(n\frac{(n+2)}{2}) \rightarrow O(n^2)$

3. Run an implementation of quicksort on a number of inputs of increasing size which incur worst-case complexity [0.2 pts]

Answer:

We chose i^2 for ranges (0, 20) for our Array sizes. And our implementation's worst-case is a reverse-sorted array since our pivot is always the right-most element. This element is always either the minimum or maximum element of the array. It's partitioning process of the array into two sub-arrays results in one sub-array being empty while the other sub-array contains the rest of the elements.

4. Plot the results, together with appropriate interpolating functions and discuss your results: do they match your complexity analysis? [0.2 pts]. **Plot:**



Answer:

Yes, it matches our complexity analysis, as stated before, the worst-case complexity is $O(n^2)$. And the graph clearly follows the $O(n^2)$ shape as discussed in the class.